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UDC 543.544:621.899

**Determination of Group Composition of Oils by
High-Efficiency Liquid Chromatography**

18410271F Moscow *KHIMIYA I TEKHNOLOGIYA*
TOPLIV I MASEL in Russian No 8, Aug 89 pp 42-43

[Article by N. I. Vinogradova, A. O. Larionova, O. G. Larionov, and M. I. Falkovich, Institute of Physical Chemistry, USSR Academy of Sciences; Moscow Institute of Oil and Gas imeni I. M. Gubkin]

[Abstract] A study is made of the possibility of using high- efficiency liquid chromatography as a fast, easily accessible method to monitor the chemical composition of petroleum. Studies were performed on a chromatograph using an ultraviolet photometer to analyze aromatic hydrocarbons and an HP refractometer to analyze paraffin-naphthene hydrocarbons. The method is found to be quite satisfactory for rapid determination of the group hydrocarbon composition of oils and for monitoring of this characteristic during the use and regeneration of oils. Figures 4; References 5: 4 Russian, 1 Western.

547.812.5:818.1:821.3:668.82

Conformational Analysis of Cyanine Dyes Using Overhauser Nuclear Effect*18410169A Kiev TEORETICHESKAYA I
EKSPERIMENTALNAYA KHIMIYA in Russian
Vol 25 No 1, Jan-Feb 89 (manuscript received
27 Feb 86) pp 87-92*

[Article by M. Yu. Kornilov, A. V. Turov, V. V. Kurdyukov, M. A. Kudinova, and A. I. Tolmachev, Kiev State University imeni T. G. Shevchenko; Organic Chemistry Institute, Kiev]

[Abstract] The spatial structure of pyrilo- and thiopyrilyl-anines have not yet been studied, although such information would make it possible to analyze more thoroughly the rules governing coloration of these dyes, which are interesting from both a theoretical and a practical standpoint. Recently, the spatial structure of symmetrical monomethinecyanines was studied by using PMR spectroscopy, and it was established that in contrast to the pyrido-2-derivatives, which exist entirely in the trans form, the former's oxygen-containing analogue exists in the mono-cis form, while the sulfur-analogue exists in the di-cis conformation. In the present work the Overhauser nuclear effect was employed to establish the conformational composition of monomethine- and trimethinecyanine dyes in solution and containing a pyrilium, thiopyrilium, or pyridinium nucleus as auxochrome. The monomethinecyanines are shown to exist in one of the possible conformations, while the trimethinecyanines exist as a mixture of conformers, steric factors determining the quantitative ratio. Inclusion of the monomethine dye chromophore in a seven-link ring leaves the conformational mobility of the ring intact. Figure 1; references 10: 5 Russian, 5 Western.

539.196.3

Quantum Chemical Simulation of Solvation Processes of Dicyanamide and Tricyanmethanide Ions*18410169B Kiev TEORETICHESKAYA I
EKSPERIMENTALNAYA KHIMIYA in Russian
Vol 25 No 1, (manuscript received 27 Jan 87) pp 92-96*

[Article by S. V. Garbuz, V. V. Skopenko, V. D. Khavryuchenko, and N. N. Gerasimchuk, Kiev State University imeni T. G. Shevchenko]

[Abstract] An explanation of anionic solvation by solvent molecules is important both for the theory of solutions and to explain the stability of complexes formed in them. In a previous study quantum chemical methods were employed to study the solvation of halogenide ions by various solvents, and certain conclusions were drawn regarding the structures of their solvates. The so-called non-linear pseudohalogenide ions dicyanamide $N(CN)_2^-$ and tricyanmethanide $C(CN)_3^-$ form coordination compounds of various compositions and structures manifesting varying denatations. Furthermore, some nonlinear anions such as $N(CN)_2^-$ and $C(CN)_2NO^-$ become hydrolyzed and solvated

in the presence of heavy metals. This requires taking into account the effects of the solvent when studying reactions of complex formation with the above ligands. In the present work a quantum chemical simulation was made of the solvation of $N(CH)_2^-$ and $C(CN)_3^-$ ions in the "supermolecular" approximation, which appears to be the most correct method for describing the specificity of solvation. The SSP method of linear combinations of atomic orbitals-molecular orbitals (LCAO-MO) in a semiempirical approximation was employed to calculate spatial and electronic structures of the dicyanamide and tricyanmethanide ions with alcohols, water, chloroform, and methylene chloride as solvents. It was demonstrated that monosolvates of the above anions are intermolecular complexes with moderately strong H-bonds. Figures 3; references 12: 9 Russian, 3 Western.

541.183

Autodiffusion of Certain Molecules on Surface of Pyrogenic Silica*18410169C Kiev TEORETICHESKAYA I
EKSPERIMENTALNAYA KHIMIYA in Russian
Vol 25 No 1 (manuscript received 16 Jun 87) pp 99-103*

[Article by V. V. Brey and A. A. Chuyko, Surface Chemistry Institute, Kiev]

[Abstract] Information on the mobility of molecules on solid surfaces plays an important role in forming concepts of the mechanisms of adsorption and chemisorption. The coefficient of autodiffusion of adsorbed molecules may be determined by the pulsed gradient NMR method, which is based on measuring nuclear magnetic resonance in a pulsed non-uniform magnetic field. This method was used specifically to study the mechanisms of intercrystalline diffusion in zeolites and the migration of adsorbed molecules in silica gels and carbon sorbents. The same method was used in the present work to measure the translational mobility of acetone, acetonitrile, benzene, hexane, methanol, and trimethylchlorosilane molecules on the surface of aerosil, a non-porous pyrogenic silica gel. The resulting coefficients of autodiffusion were compared with corresponding values on silica gel surfaces. Figures 2; references 11: 6 Russian, 5 Western.

541.123.22+547.962

Study of Reaction of Serum Albumin With Dimethylsulfoxide With PMR Spectra of Frozen Aqueous Solutions*18410169D Kiev TEORETICHESKAYA I
EKSPERIMENTALNAYA KHIMIYA in Russian Vol 25
No 1, Jan-Feb 89 (manuscript received 13 Jan 87)
pp 104-108*

[Article by V. K. Pogorelyy, V. V. Turov, A. V. Turov, and V. N. Barvinchenko, Physical Chemistry Institute imeni L. V. Pisarzhevskiy, Kiev]

[Abstract] Interest in studying intermolecular reactions of various substances with serum albumin thrives on the fact that it is one of the basic proteins that facilitate

transport of biologically significant compounds within the organism. Fixation of low (below 500) molecular weight molecules with albumin has been studied by using a variety of methods including spectrophotometry. The latter is effective only if the ligand is readily identifiable in the visible or near-UV ranges of the absorption spectra. NMR spectra provide information on the structure of associates and on the dynamics of the intermolecular binding process. However, direct study of the reactions of the functional groups of a protein with the molecules of a ligand by using the spectra of aqueous albumin solutions is encumbered with the difficulty of identifying amino acid groups in the biopolymer in the NMR spectra. In the present work PMR spectra were employed to study the reaction of human serum albumin with dimethylsulfoxide by using the proton signal intensity of nonfrozen water at 230-273 K. It was demonstrated that the concentration of dimethylsulfoxide in nonfrozen water is greater than that to be expected for a simple eutectic. This is due to the fixation of N molecules of dimethylsulfoxide with a serum albumin molecule. At 270K, $N = 7$ to 10. Also, the quantity of nonfrozen water was observed to be much higher in the presence of dimethylsulfoxide. This is apparently due to the reaction of dimethylsulfoxide with proton-active sites on the protein through water molecules. Figures 5; references 5: 3 Russian, 2 Western.

UDC 183.4:577.156.3

Properties of Trypsin, Immobilized on Surface of Organosilicas

18410169E Kiev TEORETICHESKAYA I
EKSPERIMENTALNAYA KHIMIYA in Russian
Vol 25 No 1, Jan-Feb 89 (manuscript received 17 Sep 86)
pp 113-116

[Article by V. V. Yanishpolskiy, G. V. Lyubinskiy, and V. A. Tertykh, Surface Chemistry Institute, Kiev]

[Abstract] Immobilized enzymes remain catalytically active in solution without altering substrate specificity. The relationships of catalytic activities of immobilized and native biocatalysts to substrate concentration are frequently described by similar equations, although some specific values of the constants may vary. Furthermore, during immobilization, certain biocatalyst properties may change significantly. For example, where the inactivation kinetics of native enzymes normally follows a first order reaction equation, biocatalysts fixed on carrier surfaces result in an equation representing the total of two components. This is due to the change in the enzyme itself as well as the physical chemical factors caused by the presence of a solid/liquid interface between the substrate and the reaction product. In the case of trypsin, the native enzyme becomes activated in the presence of Ca^{+2} ions, and a change in sensitivity to calcium ions is observed after immobilization. As the concentration of the latter is increased, the activity of an immobilized preparation either remains unaltered or even decreases, depending on the binding method. At the

present time, it is still not possible to predict just how the properties of an enzyme will change during reaction with a specific chemical surface, and in view of this it became interesting to study the effects of various protein macromolecule-to-inorganic matrix binding methods on the properties of trypsin. This type of data are presented in the present work for two previously proposed silica carriers having grafted cyanuram chloride (CCI-silochrome) and polymaleic acid anhydride (MA-silochrome) on the surface layer. A significant (three-fold) increase was observed in trypsin activity immobilized on introduction of 10^{-2} moles per liter of calcium chloride to the substrate solution. Activation of the enzyme is reversible, and the rate of the catalytic reaction dropped to its initial value on elimination of the Ca^{+2} ions with EDTA. This effect was not observed with the CCI-silochrome bound enzyme. The immobilized enzyme was also observed to be more stable than the native. The observed effects are evidently due to the changing properties of the biocatalyst molecule after binding with the solid matrix. Figures 3; references 8: 2 Russian, 6 Western.

541.128+543.544

Study of Bromine Desorption From Intercalated Graphite- Bromine

18410169F Kiev TEORETICHESKAYA I
EKSPERIMENTALNAYA KHIMIYA in Russian
Vol 25 No 1, Jan-Feb 89 (manuscript received 5 Jan 87)
pp 120-123

[Article by L. S. Lysyuk, K. N. Khomenko, and A. A. Chuyko, Surface Chemistry Institute, Kiev]

[Abstract] Study of the structural and energy characteristics of intercalate strata aids in understanding the physicochemical properties of intercalated graphite compounds, and in this respect the graphite-bromine system is particularly interesting since the presence of flat two-dimensional intercalate structures, whose parameters are commensurate with the lattice parameters of vicinal graphite layers, has been established. The nature of bromine interaction with graphite depends on the nature and structure of the initial material and the intercalate reaction conditions. X-ray spectroscopy, electron microscopy, and diffractometry have been used to study intercalation kinetics and two-dimensional phase transitions in intercalant strata. Bromine desorption was studied mainly at room temperature over long time intervals (to 20 days) or at temperatures not exceeding 400 K. It has been established that as a result of desorption, the stoichiometric composition of the intercalated compound changes from C_8Br to $C_{35}Br$ after passing through three intermediate stages during which the structure of the intercalant changes, but the flat nucleus remains intact. In the present work gas chromatography and static adsorption methods were employed to study a bromine-graphite system characterized by the presence of

intercalant structures commensurate with vicinal graphite strata. An adsorption-desorption isobar and isotherm were determined for the temperature range 278-393 K. The shape of the curves indicates the presence of reversible phase transitions between the second and fourth stages of intercalation. Activation

energies of desorption for two intercalated forms of bromine were determined from data collected at 390-550 K. It was demonstrated that the thermal effect of the transition from the ionized intercalant to the molecular form comprises 10.4 kJ per mole. Figures 2; references 13: 1 Russian, 12 Western.

576.6.695

**Adhesion Immobilization of Microorganisms
During Water Treatment**

18410154K Kiev *KHIMIYA I TEKHOLOGIYA
VODY in Russian Vol 11 No 2, Feb 89 (manuscript
received 14 Jul 88) pp 158-169*

[Article by G. N. Nikovskaya, Colloidal Chemistry and
Hydrochemistry Institute, Kiev]

[Abstract] Immobilization, or fixation, of microorganisms is one of the fundamental methods for the microbiological treatment of water. The task facing researchers is to select and develop an immobilization method that preserves the biochemical activity of the microorganisms with respect to the contaminated water and to curtail excessive loss of microorganisms from the bioreactor. There are four viable types of immobilization: a) adhesion, b) chemical attachment of cells to one another or to

a carrier with bifunctional reagents, c) mechanical inclusion of the cells in a gel, and d) electrical fixation based on reverse polarized fixation on a carrier by applying an electrical field. Thus the term "immobilized cells" signifies cells fixed on a solid surface or included in a gel, or cellular agglomerates. The first three types of immobilization are considered the most promising for the development of biotechnology. The present work is a review of the literature over the past decade on adhesion of microorganisms in aqueous systems, the development of biofilms on various materials, and utilization of water-insoluble carrier-fixed microorganisms in water treatment. Information on the sorption capacity of certain materials with respect to microorganisms and various ways for increasing the adhesion effectiveness of immobilized microorganisms are presented together with methods for accelerating the start-up of bioreactors having fixed biofilms. The prospects of using film-type bioreactors in water treatment are also discussed. References 101: 46 Russian, 55 Western.

UDC 541.8.541.13

Conductivity of Hydrocarbon Solutions of Dialkyldithiophosphates

18410227G Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59 No 8, Aug 89 (Manuscript
received 9 Nov 87), pp 1743-51

[Article by T. A. Zharinova, N. M. Semenikhin, N. F. Falendysh, Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian Academy of Sciences, Kiev]

[Abstract] A study is made of the influence of various factors on the conductivity of hydrocarbon solutions of dialkyldithiophosphates. An analytic equation is derived

to describe the conductivity isotherms at various surfactant concentrations in nonpolar solvents. The contribution of noncontact dipole-dipole reactions between molecules to the dissociation of the surfactant and conductivity of the hydrocarbon solution is estimated. Specific donor-acceptor and noncontact dipole-dipole interactions between surfactant molecules are found to be complementary rather than competitive, their action varying with temperature. The contribution of both chemical and dipole-dipole reactions to surfactant dissociation in a nonpolar medium decreases with increasing temperature, along with an increase in thermal dissociation. This association-dissociation mechanism is most clearly seen for dialkyldithiophosphates with isostructure hydrocarbon radicals and when traces of water are present. Figures 2; References 14: 12 Russian, 2 Western.

UDC 631.811

Agrochemical and Ecological Monitoring in RSFSR

18410247A Moscow *KHIMIZATSIYA SELSKOGO KHOZYAYSTVA* in Russian No 8, Aug 89, pp 24-26

[Article by S. A. Shafran, M. M. Pushkareva, L. V. Chechetkina, O. Yu. Tsittser, All-Russian Scientific Research and Planning and Technological Institute for Chemicalization of Agriculture]

[Abstract] Four full cycles of soil monitoring have been performed in the RSFSR in which trends in changes in the soil have been indicated and positive and negative influences of the chemicalization of agriculture have been established. Whereas the positive balance of phosphorus, potassium, and calcium can be evaluated positively, the situation with nitrogen is quite alarming. A positive balance of nitrogen has been observed in the Russian Federation in recent years, and this has resulted in a nitrogen imbalance and caused pollution of bodies of water. This has been caused by excessive nitrogen fertilization plus the biological specifics of the crops raised. Nitrate contamination of well water was observed in 43% of wells tested. A unified program of scientific research is needed to consider the environmental as well as agricultural results of soil fertilization.

UDC 631.812.2:631.416.9

Nitroammophoska With Trace Elements

18410247B Moscow *KHIMIZATSIYA SELSKOGO KHOZYAYSTVA* in Russian No 8, Aug 89, pp 34-35

[Article by Ye. N. Nazarova, Yu. V. Tsekhanskaya, State Institute of the Nitrogen Industry, A. P. Safonov, Leningrad Agricultural Institute]

[Abstract] Experimental batches of nitroammophoska 16-16-16 were produced that contained trace additives of boron or boron plus magnesium at the State Institute of the Nitrogen Industry. Sources of the trace elements were boric acid and boromagnesium ore. Introduction of the trace additives increased the strength of the fertilizer and decreased its caking properties while retaining its hygroscopic properties. The fertilizers were tested and found to have no negative effect on the agrochemical properties of soddy podzolic loamy soils.

UDC 631.8:631.92

Mineral Fertilizer and Environment

18410247C Moscow *KHIMIZATSIYA SELSKOGO KHOZYAYSTVA* in Russian No 8, Aug 89, pp 37-39

[Article by I. N. Cherednichenko, candidate of agricultural sciences, Scientific Research Institute of Vegetable Farming]

[Abstract] The influence of mineral fertilizer on the fertility of irrigated soils and the environment was studied at Bykovo State Farm in the Moscow Oblast in 1976-1986. Experiments were performed in a five-field vegetable and feed crop rotation system (cabbage—cabbage—carrots—beets—oats for green feed plus a peas-and-oats mixture). Mineral fertilizers were highly effective in increasing the harvest but may be dangerous for human and animal health if their unrestricted use is allowed. Nitrate nitrogen can migrate through the soil to create a threat of pollution of groundwater. New levels of fertilizer are recommended that are 1.5 to 2 times lower than those computed by present methods.

UDC 631.82:633.524.2.31

Influence of Fertilizers on Groundwater Status

18410247D Moscow *Khimizatsiya Selskogo Khozyaystva* in Russian No 8, Aug 89, pp 40-41

[Article by T. B. Azizov, candidate of agricultural sciences, R. K. Trofimova, candidate of biological sciences, Kh. A. Khalikov, Uzbek Bast Crop Experimental Station]

[Abstract] Losses of N, P, and K from soils due to erosion and seepage can cause contamination of groundwater. The influence of mineral fertilizer on groundwater was studied at an experimental base of the Uzbek Bast Crop Experimental Station in 1986-1988. Irrigation causes significant rises in groundwater level in test wells. The content of nitrates, inorganic phosphorus, and potassium in the groundwater rose significantly in May through August in comparison to the April levels, sometimes by several times, reaching the maximum permissible quantities for nitrates. Nitrate and ammonia nitrogen migrate relatively easily through the aeration zone with intensive irrigation. The potassium ion content of the groundwater during the vegetation season is much higher. References 3: Russian.

661:525.661.185.1

IR-Spectrographic Study of Reactions of Components of Mixed NP- and NPK-Fertilizers With Aliphatic High Amines*18410184A Leningrad ZHURNAL PRIKLADNOY KHIMII in Russian Vol 62 No 3, Mar 89 (manuscript received 16 Dec 87) pp 481-486*

[Article by B. V. Rassadin, N. P. Sorokina, V. V. Kuznetsova, L. N. Shcherbakova, and Yu. V. Tsekhan-skaya, Nitrogen Industry and Organic Synthesis Products SRI (State)]

[Abstract] Quality improvement in conjunction with the growing volume of mineral fertilizer production has become a foremost national economic problem. This is especially true in respect to conditioned mixed NP- and NPK-fertilizers, where the specifications do not always meet high-quality standards. Quality can be improved by modifying the surface of the finished product with surfactants such as aliphatic high molecular amines. Although this reduces caking, it is not economical owing to high production costs involved with separation and refining. It appears more advantageous to use amine production wastes, namely, the so-called vat bottoms (TU-6-02-750-78). They are effective conditioning agents and provide a means of disposing of an industrial waste. Ammonium nitrate treated with vat bottoms has almost no tendency to cake. It reacts in the presence of moisture with amines to form alkylammonium nitrates, and this reaction provides the basic factor for fixation of the amines on the ammonium nitrate particle surface. Similarly, alkylammonium sulfates are formed between the amines and ammonium sulfate. In the present work an analogous study was made of the components of mixed nitrogen-phosphorus fertilizers and their reactions with aliphatic amines. The data confirm a previously made conclusion that fixation of the amines takes place by chemisorption, with water playing a decisive role. Figures 2; references 8: 4 Russian, 4 Western.

UDC 633.521:631.8.022.3

Fertilizer in Flax Crop Rotation System*18410247E Moscow KHIMIZATSIYA SELSKOGO KHOZYAYSTVA in Russian No 8, Aug 89, pp 44-46*

[Article by L. I. Petrova, candidate of agricultural sciences, All-Union Scientific Research Institute of Flax]

[Abstract] The author's institute studied the effectiveness of manure in combination with mineral fertilizers in

a flax crop rotation system. Over five rotations (40 years), versions were studied including no fertilizer, manure, $N_{200}P_{100}K_{240}$ equivalent to 20 t/ha manure, and manure plus mineral fertilizer. The experiments have shown that the combination of manure plus mineral fertilizer is the best system of fertilization and ensures good productivity of the soddy podzolic soil and a high degree of participation of the fertilization in formation of the harvest. Manure is used on the field twice with red clover and potatoes, and mineral fertilizer is used each year; each contributes half of the total NPK.

UDC 633.11324":632.4:63.82

Fertilizer and Crop Status*18410247F Moscow KHIMIZATSIYA SELSKOGO KHOZYAYSTVA in Russian No 8, Aug 89, pp 48-50*

[Article by V. M. Chmulev, candidate of agricultural sciences, Northern Caucasus Affiliate, NIKPTIZh Institute; A. A. Gavrilov, candidate of agricultural sciences, Stavropol Agricultural Institute]

[Abstract] In field studies during the period 1975-1988 involving large-scale utilization of liquid ammonia with winter wheat, losses to plant diseases were reduced by up to three times. The use of the agronomically optimal dose of ammonia with sufficient phosphorus-potassium nutrition created conditions for growth of plants while suppressing disease pathogens. Plant productivity also improved.

UDC 631.8:633.49

Nitroammophoska on Potatoes*18410247G Moscow KHIMIZATSIYA SELSKOGO KHOZYAYSTVA in Russian No 8, Aug 89, pp 59-61*

[Article by V. A. Volodin, Komi State Pedagogic Institute]

[Abstract] The author's institute studied the influence of doses and methods of application of nitroammophoska on harvest and potato quality in 1986-1988 on soddy podzolic loamy, well-cultivated soil. The methods and doses of application of nitroammophoska were found to influence the harvest level significantly. The local method of application of a single dose of nitroammophoska assisted in rapid accumulation of the potato harvest by significantly accelerating the process of tuber formation early in the season. A one-time application of nitroammophoska slightly decreased the content of dry matter and starch in the potatoes while significantly improving the harvest and increasing the total starch yield by over 20%. References 10: Russian.

UDC 631.84:633.15

Nitrogen Fertilizers on Winter Rye

18410247H Moscow *KHIMIZATSIYA SELSKOGO KHOZYAYSTVA* in Russian No 8, Aug 89, pp 68-69

[Article by V. A. Prudnikov, candidate of agricultural sciences, Belorussian Scientific Research Institute of Agriculture]

[Abstract] In 1985-1988, the Belorussian Scientific Research Institute of Agriculture undertook field experiments on the influence of dose and time of application of nitrogen fertilizer on the harvest of winter rye in soddy, podzolic soil following an oat crop. The results showed that when an insufficient quantity of N was applied during the first fertilization, the addition of a larger quantity during later stages did increase the grain harvest, while smaller quantities actually tend to decrease the harvest. At N_{60} , the yield per kg of nitrogen is 28.8 kg of grain, at N_{120} —only 21.2 kg of grain per kg

of nitrogen. The greatest nitrogen utilization factors were achieved at N_{60-90} . The use of kampoza decreased the harvest and the nitrogen utilization factor. References 5: Russian.

UDC 633.15:631

Effectiveness of Fertilizers on Corn

18410247I Moscow *KHIMIZATSIYA SELSKOGO KHOZYAYSTVA* in Russian No 8, Aug 89, pp 71-72

[Article by N. A. Inshin, candidate of agricultural sciences, Elita Scientific Production Association, Sumy]

[Abstract] In 1986-1988, the author's association studied the productivity of grain corn as a function of the level of mineral nutrition: no fertilizer, $N_{120}P_{120}K_{120}$, $N_{180}P_{180}K_{180}$ with plant densities 50-150·10³/ha. Optimal was found to be $N_{120}P_{120}K_{120}$ (70,000 plants per hectare). This level yielded the maximum harvest.

UDC 621.315.592.3

Use of Getter Heat Treatment To Purify Plates of Nuclear-Doped Silicon*18410264H Moscow VYSOKOCHISTYYE
VESHCHESTVA in Russian No 3, May-Jun 89
(Manuscript received 26 Oct 88) pp 201-04*

[Article by N. F. Golubev, A. G. Dutov, V. A. Komar, A. V. Latyshev, and V. M. Lomako, Scientific Research Institute of Applied Physics Problems imeni A. N. Sevchenko, Belorussian State University imeni V. I. Lenin; Institute of Solid-State and Semiconductor Physics, Belorussian Academy of Sciences, Minsk]

[Abstract] The possibility is studied of purifying plates of nuclear-doped silicon to remove point defects and impurities by heat treatment at 1,100-1,200 °C in a phosphorus-containing atmosphere. Plates were cut from silicon specimens heat treated at 800 °C for 120 min. Selective etching and optical microscopy were used to check the density of microdefects. The content of impurities was estimated by activation analysis. It was found that Getter heat treatment at 1,100-1,200 °C did not significantly change the concentration of phosphorus impurities or the uniformity of their distribution but did significantly increase the life time of nonbasic charge carriers in the specimens. Getter heat treatment anneals a portion of the residual small radiation defects and

removes the impurity-defect atmosphere near the surface of the plate in the highly doped region. Effective elimination of fast diffusion impurities and defects in the bodies of the plates requires a temperature of over 1,100 °C. The result is significant improvement in the electrophysical parameters of the material. References 10: 9 Russian, 1 Western.

UDC 546.3-19'11

Reaction of Intermetallic Compounds $\text{La}_{1-y}\text{R}_y\text{Ni}_{5-x}(\text{T}^1, \text{T}^2)_x$ With Hydrogen, Where $\text{R}=\text{Ce}, \text{Pr}, \text{Mm}$; $\text{T}^1=\text{Cu}$; $\text{T}^2=\text{Al}, \text{Ti}, \text{Sn}, \text{V}, \text{Fe}$ *18410277A Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 8, Aug 89 (Manuscript
received 24 Dec 87), pp 1697-1703*

[Article by L. A. Petrova, V. V. Burnasheva, K. N. Semenenko, Institute of New Chemical Problems, USSR Academy of Sciences, Chernogolovka]

[Abstract] A study is made of the interaction of multi-component compounds of the composition mentioned in the title (where Mm is mish metal) with hydrogen. A family of hydrogen absorbents was used. Multicomponent compositions were thus created for the absorption of hydrogen, the hydride phases of which contain 1.4-1.45 mass % hydrogen and have an equilibrium dissociation pressure that can be varied over a broad range. Figures 4; References 13: 3 Russian, 10 Western.

UDC 621.315.592:669'778'871

Mechanism of Contamination of GaAs Single Crystals With Carbon During Manufacture

18410265E Moscow VYSOKOCHISTYYE
VESHCHESTVA in Russian No 4, Jul-Aug 89
(Manuscript received 25 Aug 88) pp 210-13

[Article by Yu. N. Bolsheva, M. A. Ilin, A. V. Markov, M. G. Mikhaylova, A. M. Nosovskiy, and V. B. Osvenskiy, State Scientific Research and Planning Institute of the Rare Metals Industry, Moscow]

[Abstract] The variation in content of background carbon in single crystals of undoped GaAs is studied as a function of manufacturing details. Studies are performed on single crystals produced by horizontal directed crystallization and the Chokhralsky method at low and high inert gas pressures. The measurements showed that the carbon concentration varied broadly in single crystals produced by the Chokhralsky method. The carbon concentration does not increase with an increase in hot graphite mass in the chamber, but does increase with increasing inert gas pressure and decreases when oxygen is introduced to the melt. The mechanism of contamination of the crystals includes oxidation of graphite, transfer of carbon monoxide through the flux, and reduction of the carbon monoxide in the melt. Figure 1; References 7: Western.

UDC 543.544.25:66.063

Concentration of Phosphine Impurity in Germanium by Diffusion Through Polymer Membrane

18410265F Moscow VYSOKOCHISTYYE
VESHCHESTVA in Russian No 4, Jul-Aug 89
(Manuscript received 24 Jan 89) pp 236-39

[Article by V. M. Vorotyntsev, P. N. Drozdov, S. A. Nosyrev, V. A. Krylov, and A. Ye. Yezheleva, Institute of Chemistry, USSR Academy of Sciences, Gorkiy]

[Abstract] One promising method of concentration of impurities in gases is diffusion through a polymer membrane. This article studies the capabilities of this method for analytic concentration of phosphine impurities in germanium. Experiments on enrichment of impurity by diffusion through a polymer membrane were conducted on a mixture of germanium and phosphine with a concentration of $3.4 \cdot 10^{-7}$ vol. percent by using a Lestosil membrane with a concentration factor of 2.1, with phosphine penetrating through the membrane more easily than germanium. The concentration process was performed at $2 \cdot 10^5$ Pa/ $0.5 \cdot 10^4$ Pa. The gas mixture was passed through the membrane six times. The process succeeded in decreasing the detection limit of phosphine by more than an order of magnitude. Figure 1; References 12: Russian.

UDC 547.52:541

Mechanism of Catalysis of Arbuzov Reaction by Complex Transition Metal Compounds. I. Study of Ni(II) Chloride-Organic P(III) Derivative System by EPR, NMR, and Electron Spectroscopy

18410277H Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 8, 89 Aug 89 (Manuscript received 8 Dec 87) pp 1769-73

[Article by V. V. Sentemov, Ye. A. Krasilnikova, I. V. Berdnik, V. I. Morozov, A. V. Ilyasov, F. Sh. Shagvalyev, T. V. Zyкова, Izhevsk Agricultural Institute; Kazan Chemical Technology Institute imeni S. M. Kirov; Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov; Kazan Affiliate, USSR Academy of Sciences]

[Abstract] In order to determine the behavior of Ni(II) salts in the phosphorylation of aromatic halides by P(III) acid esters, with catalysis by transition metal salts, the authors studied the system Ni(II)-P(III) compounds, Ni(II)-P(III) compounds-organic solvent (ethanol, benzene, toluene). In the first stages of catalysis of the reaction of inactivated aryl halides with P(III) acid derivatives by Ni(II) chloride, phosphorus-containing Ni(II) complexes are formed. Heating of systems containing Ni(II) compounds and $R_n^1P(OR^2)_{3-n}$ in organic solvents causes a reduction of the Ni(II) to Ni(0) and Ni(I). The composition and structure of the Ni(I) complexes depend on the nature of organic P(III) derivatives present and the temperature. Figures 2; References 22: 15 Russian, 7 Western.

UDC 547.35+547.421.136.25

Reaction of Unsaturated Organic Tin Compounds With 1- Iodoheptafluoropropane, Catalyzed by Transition Metal Complexes

18410277I Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 8, Aug 89 (Manuscript received 31 Dec 87), pp 1818-23

[Article by K. V. Kuvaldin, S. A. Klyuchinskiy, V. S. Zavgorodniy, V. B. Lebedev, A. A. Petrov, Leningrad Technological Institute imeni Lensovet]

[Abstract] Continuing studies on the reactions of perfluoroalkyl iodides with unsaturated organic tin compounds, the authors studied the reaction of these reagents in the presence of transition metal complexes in order to develop a method for introducing perfluoroalkyl groups to unsaturated compounds through organic tin derivatives. The major task of the study was to determine the optimal conditions for the processes (influence of solvent type, transition metal complex type and structure, temperature, reaction time, and concentration of reagents). Studies were performed on heptafluoroiodopropane due to its comparatively high boiling point, trimethyl tin-tert-butylacetylene, trimethyl tin

phenylacetylene, and also Z- and E-trimethyl tin styrenes, the most easily available unsaturated organic tin compounds. The optimal solvent was found to be dichloroethane, hexane, or the catalysts $(\text{Ph}_3\text{P})_2\text{PdCl}_2$ or $(\text{Ph}_3\text{P})_4\text{Pd}$; the optimum temperature found was 50-70 °C; and the optimum time was found to be 3 hours. The reaction was found to occur by a free radical mechanism. Figure 1; References 17: 7 Russian, 10 Western.

UDC 547.242

**Organic Arsenic Compounds With As=N Bond.
XVI. Reaction of Arsazo Compounds With
Aldehydes, Acids, and Their Chlorides**

18410278A Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, Jul 89 (Manuscript
received 21 Jul 87), pp 1548-50

[Article by G. I. Kokorev, F. D. Yambushev, Sh. Kh. Badrutdinov, Kazan State Pedagogic Institute]

[Abstract] A study is made of the reactivity of arsazo compounds in reactions with aldehydes, acids, and their chlorides. The studies show that the arsazo compounds react only with aldehydes in the Wittig reaction to form arsinoxides and azomethines. The ease of the reaction and high yield of the compounds formed allow it to be used for the synthesis of many azomethines. References 5: 3 Russian, 2 Western.

UDC 547.242

**Organic Arsenic Compounds With As=N Bond.
XVII. Interaction of Arylarsine Dichlorides With
Tert-Butyl Amine**

18410278B Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, Jul 89 (Manuscript
received 14 Sep 87), pp 1551-56

[Article by G. I. Kokorev, R. Z. Musin, Sh. Kh. Badrutdinov, F. G. Khalitov, A. B. Platonov, F. D. Yambushev, Kazan State Pedagogic Institute; Institute of Organic and Physical Chemistry imeni A. Ye. Arbusov; Kazan Affiliate, USSR Academy of Sciences]

[Abstract] Based on known data on the stabilization of iminophosphines by steric factors, the authors studied the influence of these factors on the direction of the reaction of arsine dichlorides with primary amines and

the structure of the compounds produced. The objects of the study were arylarsine dichlorides and tert-butyl amine, the large radical of which may shield the nitrogen center in the expected iminoarsines. In contrast to the reaction of ArAsCl_2 with unbranched aliphatic primary amines, which occurs primarily in one direction, the reaction with tert-butyl amine leads to the formation of a mixture of two products—aminochloroarsines and 1,3,2,4- diazadiarsetidines. All the compounds produced are rapidly hydrolyzed upon contact with moist air. The diazadiarsetidines are produced by cyclodimerization of kinetically unstable 2-coordinated iminoarsines formed in the first stage of the reaction. References 17: 12 Russian, 5 Western.

UDC 547.242+548.737

**Organic Arsenic Compounds With As=N Bond.
XVIII. Synthesis, Properties, and Molecular
Structure of Diazadiarsetidines**

18410278C Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, Jul 89 (Manuscript
received 9 Nov 87), pp 1556-61

[Article by G. I. Kokorev, I. A. Litvinov, V. A. Naumov, Sh. Kh. Badrutdinov, F. D. Yambushev, Kazan State Pedagogic Institute; Institute of Organic and Physical Chemistry imeni A. Ye. Arbusov; Kazan Affiliate, USSR Academy of Sciences]

[Abstract] Earlier studies found diazadiarsetidines in the reaction products of arylarsine dichlorides with tert-butyl amine. Due to the poor solubility of diazadiarsetidines in benzene, they precipitate upon long standing. Similar diazadiarsetidines are formed with good yield by boiling a mixture of primary aromatic amines with bis(N,N-dialkyl)arylarsineamines or (N,N- dialkyl)chloroarylarsine amines in toluene. Thermal elimination of the aromatic amine molecule from the $\text{ArAs}(\text{NHAr}')_2$ formed in the first stage leads first to arsinimines, which then dimerize to the kinetically more stable diazadiarsetidines, all of which are stable for long periods of time in an atmosphere of dry argon but hydrolyze in air to the corresponding arylarsineoxides and primary amines. X-ray structural analysis indicates that 1,3- diphenyl-2,4-di-p-bromophenyldiazadiarsetidine is a trans isomer with planar heterocycle that differs from phosphoric analogues in that the lengths of the endocyclic As-N bonds are not equal. References: 4 Russian.

UDC 547.26'118

Reaction of Dimethylalkynyl Phosphinites With Trifluoromethyl Carbonyl Compounds, Chloral, and Bromal

18410277B Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 8, Aug 89 (Manuscript
received 15 Jan 88), pp 1726-29

[Article by I. V. Konovalova, I. S. Dokuchayeva, Yu. G. Trishin, L. A. Burnayeva, V. N. Chistokletov, A. N. Pudovik, Kazan State University imeni V. I. Ulyanov-Lenin]

[Abstract] Reaction of dimethyl esters of 1-propynyl-3,3-dimethyl-1-butynyl- and 2-phenylethynylphosphonous acids both with hexafluoroacetone and with trifluoropyruvates produces (1:2) adducts—substituted 2,2-dimethoxy-1,3-dioxo-2-phosphabicyclo[3.2.0]hept-5-enes in a reaction similar to that of dialkylalkynyl phosphonites with pyruvic acid esters in boiling benzene. Dimethyl esters of alkynylphosphonous acids react with chloral, bromal, and ethyl bromopyruvate to form products of the Perkov reaction. References 6: 4 Russian, 2 Western.

UDC 547.341+542.91+547.1'118

Phosphorylation of Hydroxylamine Derivatives by Trivalent Phosphorus Acid Amides

18410277C Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 8, Aug 89 (Manuscript
received 6 Jan 88), pp 1729-33

[Article by M. K. Grachev, E. Ye. Nifantsev, Moscow State Pedagogic Institute imeni V. I. Lenin]

[Abstract] A study is made of the phosphorylation of nucleophiles, the molecules of which contain a mobile hydrogen atom, by trivalent phosphorus acid amides in order to determine the role of acid catalysts in these processes. Studies were performed on hydroxylamine derivatives. Phosphorylation of various N-hydroxy compounds yields a complex mixture of products, primarily acid phosphites and amidophosphites, while phosphorylation of hydroxamic acids with phosphorus trichloride yields exclusively cyclophosphorylated products. The phosphorylation reaction is accelerated by amine hydrochlorides. References 7: 4 Russian, 3 Western.

UDC 547.854.4:546.185

Reaction of Uracils With Trimethylphosphate and Sodium Salt of Diphenylphosphoric Acid

18410277D Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 8, Aug 89 (Manuscript
received 11 Jan 88), pp 1751-55

[Article by I. I. Kuzmenko, V. N. Bobkov, T. V. Zvolinskaya, Kiev Scientific Research Institute of Pharmacology and Toxicology, Ministry of Public Health, Ukrainian SSR]

[Abstract] Continuing a study of the reactions of uracils with other phosphoric acid derivatives, particularly trimethylphosphate, the authors observed alkylation of uracils with formation of alkyluracils. Boiling of the reagents in dimethylformamide yields 1-methyl-5-substituted uracils by methylating uracils containing electron-acceptor substituents. The reaction of uracils with trimethylphosphate in pyridine leads to the formation of comparatively stable adducts of uracil and 1-methyl-pyridinium dimethylphosphate. Similar complexes with a constant composition are obtained from uracils and the sodium salt of diphenylphosphoric acid. References 6: Russian.

UDC 541.138.2

Indirect Anodic Phosphorylation of Aromatic Compounds

18410277E Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 8, Aug 89 (Manuscript
received 9 Nov 88) p 1899

[Article by Yu. A. Babkin, D. R. Khusainova, A. S. Romakhin, Ye. V. Nikitin, Yu. M. Kargin, Kazan State University imeni V. I. Ulyanov-Lenin]

[Abstract] In an effort to decrease the working potential of anodic phosphorylation, a study was conducted to examine the possibility of using stable cation radicals to generate active phosphorylating particles from organophosphorus compounds. Stable cation radicals were generated by anodic oxidation of tris(4-bromophenyl)amine. Electrochemical oxidation of the amine in the presence of organophosphorus compounds and toluene yields a mixture of diethyltolylphosphonate isomers, with the distribution of the isomers being the same as that achieved by direct oxidation of the phosphites in the presence of toluene. References 3: 2 Russian, 1 Western.

UDC 547.341

Attachment of Dimethylphosphite to 1-Phenyl-1-butene-3-one

18410277F Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 8, Aug 89 (Manuscript
received 25 Jul 88), p 1913

[Article by B. U. Minbayev, N. I. Yashnova, B. D. Abiyurov, Institute of Organic Synthesis and Coal Chemistry, Kazakh Academy of Sciences, Karaganda]

[Abstract] Dialkylphosphorous acids in the presence of catalytic quantities of alkali metal alcoholate are attached at the carbonyl group of acetylene ketones to form acetylene oxyphosphonates. If the reaction is performed with an excess of the catalyst, the dimethylphosphite is attached at the triple bond to form the ketophosphonate. Reference 1: Russian.

Phosphoran-Phosphate Tautomerism of 2,2,2-Trichloro-1,3,4,2λ⁵-Oxadiazaphospholines

18410278E Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, Jul 89 (Manuscript
received 18 Dec 87), pp 1500-05

[Article by S. K. Tupchienko, T. N. Dudchenko, A. D. Sinitsa, Institute of Organic Chemistry, Ukrainian Academy of Sciences, Kiev]

[Abstract] Stable 2,2,2-trichloro-1,3,4-2λ⁵-oxadiazaphospholines were synthesized from N-phenyl-N'-trifluoroacetylhydrazine and N-m-trifluoromethylphenyl-N'-benzoyl hydrazine. Phosphoran-phosphate tautomerism is established in trichloro- and spirochlorophosphorans in which the phosphorus atom is included in the 1,3,4,2λ⁵-oxadiazaphospholine ring. The position of tautomer equilibrium is determined by the basicity of the medium, with acids catalyzing opening of the 5-membered ring. Replacement of chlorine atoms by fluorine in the phospholines results in stability of the phosphoran structure. References 5: 2 Russian, 3 Western.

UDC 547.81.241:543.422.4

Reversible Nucleophilic Attachment of Phosphines to Heterocyclic Cations. Structure of (2,6-Diphenyl-4H-pyran-4-yl) Triphenylphosphonium Perchlorate

18410278F Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, Jul 89 (Manuscript
received 2 Jul 87), pp 1506-15

[Article by V. T. Abayev, L. I. Kisarova, S. Ye. Emanulidi, A. A. Bumber, I. Ye. Mikhaylov, I. B. Blank, A. I. Yanovskiy, Yu. T. Struchkov, O. Yu. Okhlobystin, Scientific Research Institute of Free Radical Chemistry; Severo-Osetinsk State University, Ordzhonikidze; Scientific Research Institute of Physical and Organic Chemistry; Rostov State University; Scientific Research Institute of Rostov State University; Scientific Research Institute of Heteroorganic Compounds, Moscow]

[Abstract] The attachment of nucleophiles to free carbocations is one of the fundamental organic reactions. The mechanism of such reactions is studied. The absorption spectra of the phosphonium cations selected for study contain bands corresponding to the absorption of the initial components. Using (2,6-diphenyl-4H-pyran-4-yl)triphenylphosphonium perchlorate as an example, absorption spectral and NMR studies indicate that the dissociation of the phosphonium cations is a reversible heterolytic process of breaking of the carbon-phosphorus σ bond. The degree of dissociation of the adducts of pyrilium salts with triphenylphosphine depends on the electron-acceptor properties of the heteroaromatic cation: the more easily it is reduced, the less the corresponding pyranilphosphonium cation is dissociated. Figures 5; References 26: 13 Russian, 13 Western.

UDC 547.26'118

Reaction of Ethyl and Tert-Butyl Esters of Tetraethyldiamidophosphorous Acid With Tert-Butyl Hypochlorite, N-Chlorodiethylamine, and Propylsulfenyl Chloride

18410278G Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, Jul 89 (Manuscript
received 18 Dec 87), pp 1515-19

[Article by T. Kh. Gazizov, L. K. Salkeyeva, Yu. V. Chugunovo, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov; Kazan Affiliate, USSR Academy of Sciences]

[Abstract] In order to clarify details of the mechanism of the reaction of P(III) acid derivatives with hypochlorites, chloramines, and sulfenyl chlorides, the authors studied the reaction of ethyl and tert-butyl esters of tetraethyldiamidophosphorous acid with tert-butyl hypochlorite, N-chlorodiethylamine, and propylsulfenyl chloride in various solvents. It was found that the phosphites of the esters interact with tert-butylhypochlorite in methylene chloride exclusively with the formation of tetraethyldiamidochlorophosphate. These same reactions in petroleum ether occur in two directions: to form the chlorophosphate and ethyl(tetraethyldiamido)phosphat and the chlorophosphate and tert-butyl(tetraethyldiamido)phosphate in ratios of 1:2 and 3:1. The direction of occurrence of the reaction is obviously determined by the properties of the alcoholate form of the intermediate quasiphosphonium compound formed in the first stage of the reaction. References 8: 6 Russian, 2 Western.

UDC 541.67:541.65+539.194

Molecular Polarizability of Organic Compounds and Their Complexes. XXXVI. Conformation of Tertiary Aromatic Phosphine Selenides

18410278H Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, Jul 89 (Manuscript
received 17 Nov 87), pp 1519-23

[Article by S. B. Bulgarevich, S. Ye. Filippov, D. Ya. Movshovich, L. V. Goncharova, A. A. Shvets, Scientific Research Institute of Physical and Organic Chemistry; Rostov State University]

[Abstract] The dipole moments, molar refractions, and molar Kerr constants of a number of triarylphosphine selenides were determined in solutions of carbon tetrachloride. The aromatic rings of the molecules studied are found to be rotated by 38-49° from the orientation, with tilting of the P=Se bond in direction of the P-C_{ar} bond. The conformations of the Ph₃Px molecules as well as tris-m-tolylphosphine sulfide and selenide are different in solution and in solid phase. References 23: 10 Russian, 13 Western.

UDC 547.241

Synthesis of Vinyldiphenylphosphine Oxide From Diphenylphosphinous Acid

18410278I Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, Jul 89 (Manuscript
received 11 Dec 87), pp 1533-37

[Article by N. A. Bondarenko, Ye. N. Tsvetkov, All-Union Scientific Research Institute of Chemical Reagents and Highly Pure Chemical Substances, Moscow]

[Abstract] Methods are described for the synthesis of vinyldiphenylphosphine oxide from diphenylphosphinous acid, which is readily available. Two methods of synthesis are discussed—the Arbuzov regrouping of O-trimethylsilyldiphenylphosphinite with dibromoethane and subsequent dehydrobromination of the β -bromoethyl derivative formed and synthesis through β -oxyethyldiphenylphosphine oxide. Reaction of O-trimethylsilyldiphenylphosphinite with a fivefold excess of dibromomethane and subsequent treatment of triethylamine yields a mixture of vinyldiphenylphosphine oxide and tetraphenylethylenediphosphine oxide in a ratio of 3:7. References 16: 10 Russian, 6 Western.

UDC 542.91:547.1'118

Reaction of Dimethylaminomethylenephénylphosphine With Polyethylhydrosiloxane

18410278J Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, Jul 89 (Manuscript
received 6 Jun 88), pp 1673-76

[Article by A. S. Ionkin, O. A. Yerastov, B. A. Arbuzov, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov; Kazan Affiliate, USSR Academy of Sciences]

[Abstract] Dimethylaminomethylenephénylphosphine reacts with polyethylhydrosiloxane at 140-150 °C to form dimethylaminomethyl(phenyl)ethylphosphine(I) and bis(dimethylaminomethyl)phenylphosphine(II). Compound (I) was isolated individually. The structure of phosphines I and II was established by mass spectroscopy of their oxides. Reference 1: Russian.

UDC 547.26'118.07

Phosphorylation of Mercaptoacetone by Tetraethyldiamidophosphites

18410278K Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59 No 7, Jul 89 (Manuscript
received 15 Jun 88), pp 1677-78

[Article by A. R. Burilov, I. L. Nikolayeva, M. A. Pudovik, A. N. Pudovik, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov; Kazan Affiliate, USSR Academy of Sciences]

[Abstract] The reaction of mercaptoacetone with O-methyl-, O-butyl-, and O-ethyl-bis(N,N-diethylamido)phosphites occurs in stages. Initial replacement of one diethylamino group with a mercaptoacetone fragment leads to monothio phosphites that, when heated in a vacuum, heterocyclize with splitting of a second diethylamine molecule to yield 1,3,2-oxathiaphospholenes.

UDC 547.26'118.07

Synthesis of 1,3,2-Oxathiaphospholenes

18410278L Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, Jul 89 (Manuscript
received 7 Jun 88), pp 1679-80

[Article by A. R. Burilov, I. L. Nikolayeva, M. A. Pudovik, R. G. Musin, A. N. Pudovik, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov; Kazan Affiliate, USSR Academy of Sciences]

[Abstract] New unsaturated organophosphorus heterocycles were produced—1,3,2-oxathiaphospholenes. The compounds were synthesized by reacting mercaptoacetone and 2-mercapto-3-butanone with phosphorus trichloride and P(III) acid chlorides in benzene at 0-10 °C with 2 Eq triethylamine. All operations were performed in an atmosphere of argon. References 2: Russian.

UDC 547.26'118

Isomerization of Certain P(III)Thio Ethers With Oxygen

18410278M Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59No 7, 89 Jul 89 (Manuscript
received 25 May 88), pp 1679-80

[Article by A. R. Burilov, T. Kh. Gazizov, L. N. Usmanova, M. A. Pudovik, Ya. A. Drozdova, A. N. Pudovik, Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov; Kazan Affiliate, USSR Academy of Sciences]

[Abstract] Diphenylchlorophosphine was reacted with trimethylsilylbenzylsulfide to produce S-benzylthiophosphinite, which does not undergo transformations up to 200 °C. However, when oxygen is passed through the compound at room temperature, it isomerizes to the phosphine sulfide. Introduction of 2-chloro-1,3,2-dioxaphospholane to the reaction with trimethylsilylbenzyl sulfide leads to the corresponding P(III)thio ether, which also isomerizes to the thiophosphonate when oxygen is passed through or trimethylchlorosilane is pumped off. Phosphorylation of the methyl and ethyl esters of thioglycolic acid with diethyl(2-keto-3-pentene-4-yl)phosphite produces the corresponding P(III)thio ethers, which exothermically isomerize to thionophosphonates when oxygen is passed through or upon exposure to traces of oxygen during distillation. References 2: Russian.

UDC 547.26'118

Reaction of Tris(trimethylsilyl) Phosphite With Tribromoacetaldehyde

18410278N Leningrad ZHURNAL OBSHCHEY
KHIMII in Russian Vol 59 No 7, Jul 89 (Manuscript
received 12 May 88), pp 1681-82

[Article by V. F. Mironov, T. N. Sinyashina, Ye. N.
Ofitserov, I. V. Konovalova, A. N. Pudovik, Kazan State
University imeni V. I. Ulyanov-Lenin]

[Abstract] Tris(trimethylsilyl) phosphite was introduced to a reaction with tribromoacetaldehyde in a ratio of 1:1 in pentane at -15-10 °C to form a mixture of about 83% bis(trimethylsilyl) bromophosphate and about 13% bis(trimethylsilyl) dibromovinylphosphate plus traces of tris(trimethylsilyl) phosphate. The bis(trimethylsilyl) bromophosphate was separated (bp 52-55 °C at 0.02 mmHg). A liquid nitrogen-cooled trap was used to condense trimethylbromosilane, dibromovinyltrimethylsilane, traces of dibromoacetaldehyde, and tribromoethylene. References 4: 1 Russian, 3 Western.

UDC 665.767:621.22

Thickened Hydraulic Fluids for Industrial Equipment

*18410271A Moscow KHIMIYA I TEKHOLOGIYA
TOPLIV I MASEL in Russian No 8, Aug 89 pp 10-12*

[Article by A. A. Chesnokov, and N. Z. Chesnokova,
Kuybyshev Affiliate, All-Union Scientific Research
Institute of Oil Refining]

[Abstract] The requirements that must be met by industrial hydraulic fluids are discussed. Three different types of fluid have been developed for different applications. The new fluids are equal in their physicochemical and usage properties to Wyrol H-40, Hydex-50, and DTE-16. They are being used successfully in aluminum rolling mills, stepping motors, and hydraulic punches.

UDC 541.64:539.3

Production of Macroheterogeneous Graft Polyethylene-Polyacrylic Acid Films and Study of Their Thermomechanical Properties*18410276A Moscow VYSOKOMOLEKULARNYE SOYEDINENIYA in Russian Vol 31 No 9, Sep 89 (Manuscript received 12 Feb 88) pp 1810-14*

[Article by L. P. Krul, A. P. Polikarpov, Ye. I. Kondratovich, I. F. Osipenko, Scientific Research Institute of Physical Chemical Problems, Belorussian State University imeni V. I. Lenin; Institute of Physical Organic Chemistry, Belorussian Academy of Sciences]

[Abstract] The purpose of this work was to produce graft macroheterogeneous films with various concentration profiles of the distribution of the graft polymer through the thickness and to study their thermomechanical properties. Variations in solvent type and concentration used in liquid-phase radiation polymerization produce the variations in concentration profile. Figures 3; References 14: 10 Russian, 4 Western

UDC 541.64:547.314

Polymerization of Substituted Phenylacetylenes by Action of Metathesis Catalysts*18410276B Moscow VYSOKOMOLEKULARNYE SOYEDINENIYA in Russian Vol 31 No 9, Sep 89 (Manuscript received 12 Feb 88) pp 1815-22*

[Article by M. A. Tlenkopachev, Yu. V. Korshak, N. T. Segizova, G. N. Bondarenko, N. A. Nechitaylo, M. A. Dzyubina, Institute of Petrochemical Synthesis imeni A. V. Topchiyeva, USSR Academy of Sciences; Moscow Institute of Chemical Technology imeni D. I. Mendeleev]

[Abstract] A study is presented of the structure and properties of polyconjugate-substituted phenylacetylene polymers produced with metathesis catalysts. The spectral data indicate that substituted phenylacetylene polymers obtained with W- containing catalysts have mixed trans-transoid, trans-cisoid, and cis-transoid structures. Nd-containing catalysts form polymers with the cis-cisoid structure plus a small quantity of cis-transoid structures. MoCl₃ leads to a trans-cisoid and cis-transoid structure. The polymers are easily soluble in aromatic and chlorinated hydrocarbon film-forming polymers. A carbene polymerization mechanism is indicated. Figures 4; Reference 26: 10 Russian, 16 Western.

UDC 541.64:547.317.8

Synthesis of 1-(9-Carbazolyl),6-iodohexa-2,4-diene, Polymerization and Properties of Polymer Formed*18410276C Moscow VYSOKOMOLEKULARNYE SOYEDINENIYA in Russian Vol 31 No 9, Sep 89 (Manuscript received 15 Feb 88) pp 1823-28*

[Article by S. M. Fomin, A. I. Stash, G. N. Gerasimov, I. V. Bulgarovskaya, V. M. Vozzhennikov, N. V. Kozlova, E. N. Teleshov, Physical-Chemical Scientific Research Institute imeni L. Ya. Karpov]

[Abstract] In order to study the capabilities of internal doping, a new diacetylene monomer was synthesized: 1-(9-carbazolyl),6-iodohexa-2,4-diene(CIHD). Its capability for solid-phase polymerization and the properties of the polymer formed were studied. The polymer has an ene-ine structure. During polymerization iodine is split from the polymer, which results in internal doping of the polyconjugate system and forms radical and ionic states. The quantum photoconductance spectra of poly-CIHD are studied and reveal a broad maximum from 380 to 550 nm, a minimum at 290 nm, and another increase at wavelengths of less than 290 nm. A broad and variable maximum is found in poly-CIHD specimens at λ values greater than 600 nm because of direct ionization of impurities on structural defects and liberation of carriers by direct absorption of long-wave light quanta by filled traps. Figures 3; References 12: 4 Russian, 8 Western.

UDC 541.64:539(2+3)

Structural Changes in Uniaxially Oriented Vinylidene Fluoride Tetrafluoroethylene Copolymer Upon Deformation*18410276D Moscow VYSOKOMOLEKULARNYE SOYEDINENIYA in Russian Vol 31 No 9, Sep 89 (Manuscript received 16 Feb 88) pp 1829-34*

[Article by V. V. Kochervinskiy, V. A. Glukhov, V. G. Sokolov, Yu. K. Ovchinnikov, N. A. Trofimov, B. V. Lokshin, Moscow Textile Institute imeni A. N. Kosygin]

[Abstract] A study is made of structural changes in uniaxially oriented films of a copolymer of vinylidene fluoride and tetrafluoroethylene with elastic stress along the drawing axis. Polarized IR spectra indicate that the reason for the increase in longitudinal crystal size observed with tensile stress is a process of reversible recrystallization or further crystallization of end surface segments of crystals. Relaxation occurring during isometric holding under tensile stress is due to processes of disorientation of chain sectors in the trans conformation. Figures 6; References 11: 3 Russian, 8 Western.

UDC 541.64:547.538.141

Polymerization of Styrene and Methylmethacrylate, Initiated by Oligomer Peresters

18410276E Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 31 No 9, Sep 89 (Manuscript received 22 Feb 88) pp 1853-57

[Article by S. S. Ivanchev, V. A. Semenova, M. S. Matveyentseva, D. I. Sagaydak, Scientific Research Institute of Applied Physical Problems imeni A. N. Sevchenko]

[Abstract] A study is made of the polymerization of styrene and MMA initiated by oligoperesters produced in an earlier study. Polymerization is studied in various solvents with variable peroxide concentration and process duration. The degree of conversion of MMA and the properties of the polymers produced are found to depend on the structure and concentration of the oligoperesters used and the solvent. The data agree with a mechanism of thermal decomposition of the compounds involved. Radicals formed in the initial stage initiate polymerization and are contained in the macromolecule of the polymer as peroxide blocks, forming active polymers. The macromolecules themselves then become sources of radicals due to decomposition of the perester groups within the macromolecular chain. This can produce polymers with a high molecular mass and significant perester group content in the main chain. Figure 1; References 9: 8 Russian, 1 Western.

UDC 541(24+64):539(199+3)

Calculation of Variation of Polyethylene Chain Free Conformation Energy With Extension, Molecular Mass, and Temperature by Monte Carlo Method

18410276F Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 31 No 9, Sep 89 (Manuscript received 23 Feb 88) pp 1858-64

[Article by S. Ye. Varyukhin, M. G. Zaytsuv, Moscow State Pedagogic Institute imeni V. I. Lenin]

[Abstract] The purpose of this work is the computation and analytic approximation of the conformational free energy of polymer chains over a broad range of lengths and extensions while considering the influence of the limiting surfaces. The algorithm used in the computation was one of chain construction from point to point by the Monte Carlo method and took into account the statistical weight of the conformation. A polymer molecule was modeled as a chain of random walks through a body-centered cubic lattice in

which, of the eight possible step directions, three were permitted in each cycle. Chains with 20 to 5,000 links were studied. The results presented correspond to the case when projections of chain and attachment points on the crystalline plane coincide, i.e., the chain length vector is perpendicular to the planes. The method suggested can be used to calculate the free energy of polymer chains, which can be modeled by conformations compatible with a diamond or BCC lattice. Figures 3; References 23: 11 Russian, 12 Western.

UDC 541.64:539.3

Influence of Drawing Conditions on Strength Properties of High-Molecular Mass Polyethylene Fibers

18410276G Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 31 No 9, (Manuscript received 23 Feb 88) pp 1865-71

[Article by A. V. Savitskry, G. N. Andreyeva, I. A. Gorshkova, V. M. Pozdnyakov, I. L. Frolova, Physical Technical Institute imeni A. F. Ioffe, USSR Academy of Sciences]

[Abstract] The strength and modulus data published in recent works on the production of high-strength, high-modulus fibers by formation from solutions of high-molecular mass polyethylene with subsequent orientation drawing have differed widely. In order to determine the reasons for these differences and investigate the possibility of further increases in fiber strength, the authors studied the influence of formation and drawing conditions on strength and modulus. Greatest strength is achieved when first-stage drawing is performed at 80-130 °C. Three-stage drawing at 20-100, 130-135, and 148-150 °C yields polyethylene fibers with near-theoretical strength and modulus of elasticity values (5.5-7.0 GPa, 200-210 GPa). Figures 6; References 12: 7 Russian, 5 Western.

UDC 541.64:532.78

Crystallization in Filled Mixtures of Incompatible Polymers

18410276H 897M0028A Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 31 No 9, Sep 89 (Manuscript received 2 Mar 88) pp 1962-67

[Article by Yu. S. Lipatov, E. G. Gudova, G. V. Titov, Institute of High-Molecular Mass Chemistry, Ukrainian Academy of Sciences]

[Abstract] A mixture of crystallizing and noncrystallizing polymers is used to study the influence of introducing a filler on the packing of macromolecules of

both polymer components and establish the significance of the interface and thickness of the layers between filler particles in processes of structure formation. Aerosil is found to have a different influence on the properties of mixtures of different compositions, a result of changes in the type of interaction at the polyethylene-polybutyl methacrylate interface. Apparently, introduction of the filler to a system with PE:PBMA=3:1 causes migration of low-molecular mass impurities from the PE melt to the PE-aerosil interface as well as an increase in the mutual solubility of PE and PBMA. Small quantities of aerosil interact primarily with the continuous PBMA phase, while larger quantities increase the probability of interaction of PE with the aerosil, which increases the degree of crystallization of the PE. The properties of a filled mixture of crystallizing and noncrystallizing polymers thus depend on polymer phase composition in the boundary layers between filler particles. Figures 5; References 10: 9 Russian, 1 Western.

UDC 541(64+18.045.2)

Polymer-Analogue Reactions in Perfluorinated Membranes

18410276I 897M0028A Moscow

VYSOKOMOLEKULYARNYYE SOYEDINENIYA

in Russian Vol 31 No 9 89 Sep 89 pp 1810-2009

(Manuscript received 10 Mar 88) pp 2006-09

[Article by N. N. Voznesenskaya, R. R. Shifrina, B. V. Tarasova, E. N. Teleshov, S. F. Timashev, I. V. Vacilyeva, Scientific Research Institute of Physics and Chemistry imeni L. Ya. Karpov]

[Abstract] A study is made of the kinetics of polymer-analogue reactions leading to the production of carboxyl-containing membranes. The kinetics of the stages of chlorination and oxidation in the process of carboxylation of perfluorinated sulfocationite membranes are studied, and the conditions under which these reactions occur are found. The transport and electrochemical properties of the carboxylated perfluorinated membranes will be published later. Figures 4; References 9: 7 Russian, 2 Western.

630*863.1004.68

Combined Treatment of Wood Hydrolyzates With Ethanol

18410163a Moscow GIDROLIZNAYA I
LESOKHIMICHESKAYA PROMYSHLENNOST
in Russian No 2, Feb-Mar 89 pp 1-3

[Article by Yu. Polyak, A. I. Sizov, I. I. Balashevich, and I. G. Shtepenko, Hydrolysis of Plant Material SRI (A-U), Leningrad]

[Abstract] Increasing the biomass yield of nutrient yeasts per substrate unit remains one of the basic goals of the hydrolysis industry. It has been shown previously that the combined treatment of carbohydrate substrates with ethanol results in high biomass yields, and it has also been established that low ethanol concentrations stimulate yeast growth. However, data are lacking on the kinetics of yeast growth on a complex substrate. More recently, the theory of material-energy balance in micro-organism growth received wide attention. This theory is founded on evaluation of the effectiveness of cultivation from a certain fraction of available substrate energy converted into biomass. This type of evaluation makes it possible to derive a quantitative growth factor for micro-organisms on any substrate and to detect the growth stimulant effect in those cases where the stimulants are used in large quantities and are also sources of carbonaceous nutrition. In the present work elements of this theory were employed to demonstrate that an ethanol concentration of 0.03 to 0.12 percent is an effective growth stimulant for nutrient yeast that increases the energy yield of biomass growth by 5 to 10 percent. Greater increases of ethanol in the substrate lower the yeast yield. The stimulating effect of ethanol may be applied at operating hydrolysis plants by combining some of the brewed hydrolysate stream with the main hydrolysate. Figures 4; references 10: 9 Russian, 1 Western.

630*892.4

Tree Bark Waste—Potential Source for Feed Protein Production

18410163B Moscow GIDROLIZNAYA I
LESOKHIMICHESKAYA PROMYSHLENNOST
in Russian No 2, Feb-Mar 89 pp 3-4

[Article by I. S. Geles, N. A. Vasilyeva, and M. A. Korzhova, Forestry Institute, Kareli Branch USSR Academy of Sciences; L. A. Gusarova, V. D. Akura, O. I. Trifonova, and T. V. Krayeva, "Gidrolizprom" Scientific Production Association]

[Abstract] The search for new raw material stock is one of the basic goals of the hydrolysate-yeast industry. Soviet specialists cite enormous reserves of tree bark waste, e.g., 2,500,000 cubic meters of bark and sawdust annually. Forty percent of this is consumed as a secondary fuel, which leaves 60 percent to be dumped. The possibility of using this material as feed stock for the hydrolysis industry has not yet been worked out. At the Forestry Institute of Kareli Branch of the USSR Academy of Sciences a process was developed that utilizes the basic structural components of tree bark waste and bast fibers. The external bark is burned while the internal fiber is subjected to hydrothermal treatment at pH 3.9-4.5, 140-150° C for 45-90 minutes. The results demonstrate that the prehydrolysates of fir bark, after further treatment, may be used as feedstock substrate for making nutrient biomass. References 2 (Russian).

630*863.5

Comparative Characteristics of Trytich Hydrolysates, Prepared From Nutrient Yeasts of Various Enterprises

18410163C Moscow GIDROLIZNAYA I
LESOKHIMICHESKAYA PROMYSHLENNOST
in Russian No 2, Feb-Mar 89 pp 7-8

[Article by Z. I. Vasilyeva, V. I. Kuznetsov, L. S. Lipayeva, A. A. Mokhryakova, and O. G. Tatarnikova, Anti plague Scientific Research Institute of Siberia and the Far East, Irkutsk]

[Abstract] The search for economical protein sources to replace edible with nonedible feedstock remains a pressing problem in the production of bacteriologic nutrient media for extremely dangerous pathogens. Research conducted at the Anti plague Scientific Research Institute of Siberia and the Far East has established that fermentative hydrolysates of hydrolyzed nutrient yeasts of *Candida* species may be used as a nutrient base to obtain diagnostic nutrient media for the production of bacterial preparations. However, broader use of this material requires standardization. The conditions for growing nutrient yeasts at various East Siberian plants are varied, even when similar technologies are employed. The protein and vitamin makeup of yeasts are affected by variations in feedstock, digestion conditions, mineral resources, microflora composition, and the drying method used in the final stage. In the present work a comparative study was made of the physical chemical characteristics of nutrient yeasts produced at various East Siberian plants. Nutrient yeasts from the Zima, Biryusinsk, and Tulunsk hydrolysate plants may be used for the production of dried nutrient media to diagnose plague and cholera pathogens. Comparison of

the physical chemical properties of the various hydrolysates prepared at the above plants shows that the nutrient yeast produced at the Tulunsk plant may be recommended as a substitute for feed yeast. References 7 (Russian).

630*86(083.74):681.3.01

Data Base for Technological Level of Wood Chemical Production

18410163D Moscow *GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST* in Russian No 2, Feb-Mar 89 pp 8-10

[Article by G. Ye. Zilberbrand, Yu. I. Kuklin, V. A. Gotlib, Ye. A. Mater, and Ye. I. Romanova, Wood Chemistry SRI (Central)]

[Abstract] Standardization and quality control of production involves handling great amounts of diverse information. The volume of these data restricted only to USSR wood chemical production comprises about 2,000 typewritten pages each year. This information comes from various sources and is stored in noncentralized locations. Standardization and quality control entails a variety of arduous routine operations such as compiling inventories and tables, classification of documents, preparation of select listings, etc. This has necessitated the use of computers and modern methods of information handling. In 1984-86 a data base on the technological level of production (BD-TULP) was instituted and put into operation at the title institute. This made it possible to automate the storage and retrieval of information and prevent duplication. The structure of this data base is diagrammed in the present work. The system includes the following tree-structured hierarchy: product information, domestic and foreign normative documents, quality control methods and their accuracy, and organizations having information ties with data stored in the data base. The BD-TULP includes the YeS-1022 computer permitting operation with the base in both package and dialogue modes. Figure 1; references 4 (Russian).

630*866.1.002.6:665.947.2

Broadening Treatment and Applications of Extraction Grade Rosin

18410163E Moscow *GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST* in Russian No 2, Feb-Mar 89 p 10

[Article by N. N. Glaneva and G. A. Musina, Wood Chemistry SRI (Central)]

[Abstract] At the present time the chief consumers of rosin are the paper, paint, tire, and rubber goods industries. In addition, the synthetic rubber industry uses other products derived from rosin. Of the three grades of rosin, tall oil is the most profitable to produce. Extraction grade rosin, also profitable, does not bring as high a price. The present work outlines various ways in which extraction grade rosin could be upgraded for use in new

applications and markets, such as modification with maleic anhydride or fumaric acid to yield a product that can be used in the paper industry or as a substitute for oleo resin in the tire and rubber goods industries or in soap making. References 4 (Russian).

630*866.1.002.6:665.947.8

KEMON Resin—New Type of Modified Extraction Grade Rosin

18410163F Moscow *GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST* in Russian No 2, Feb-Mar 89 p 11

[Article by T. A. Romanina, Z. I. Petrovskaya, and V. M. Kostyuchenko, Wood Chemistry SRI (Central)]

[Abstract] The tire and rubber goods industries are the chief consumers of rosin. The unique natural composition of oleo resin makes this product especially suitable for improving the properties of rubber by increasing adhesion. Extraction grade rosin could be used were it not for its low softening point (49-52°C). Research has shown that a suitable product could be made from extraction grade rosin if the latter were modified. One such product, called EM-3, was produced, although it failed to fully satisfy the demands of the tire industry. During 1982-84 a new product was introduced called KEMON resin. This product differs from oleo resin by virtue of its lower tendency to autoxidation, and it is available in two forms, i.e., monolithic or pelletized (platelets). The pelletized form solves many problems in dosing automation during production, and it also improves labor productivity in the tire industry.

630*866.5.002.665.947.2.001.11

Effect of Fatty Acids on Fluxing Activity of Rosin

18410163G Moscow *GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST* in Russian No 2, Feb-Mar 89 p 15

[Article by R. G. Shlyashinskiy, B. G. Udarov, A. Yu. Klyuyev, D. I. Belyy, A. Ye. Izrailev, and M. V. Ivanova, Physical Organic Chemistry Institute, Minsk]

[Abstract] In a previous work it has been demonstrated that the fluxing activity of pine oleo rosin is related to the content of neutral and acidic substances in it. The neutral substances decrease fluxing activity while the acidic raise it. It is also known that oleo rosin, tall oil, and extraction grade rosin respectively contain 0.4-1.5, 6-8, and 10-12 percent fatty acid mixtures consisting mainly of unsaturated and saturated acids. The present study demonstrates that removing neutral substances and increasing the fatty acid content can raise the fluxing activity of rosin by at least 40-50 percent. Figure 1; references 2 (Russian).

630*863.1:658.56

Unified Potentiometric Method for Determining Fluorine in Yeast and By-Products of Hydrolysis Production

*18410163H Moscow GIDROLIZNAYA I
LESOKHIMICHESKAYA PROMYSHLENNOST
in Russian No 2, Feb-Mar 89 pp 17-19*

[Article by A. Soboleva and G. L. Abbyasova, Scientific Production Association Gidrolizprom]

[Abstract] Potentiometric determination of fluorine by using an ion-selective electrode is simpler to use and takes less time than do either the photometric or

titrimetric methods. The selectivity of the fluoride electrode is so high that even a 1,000-fold excess of nitrate, phosphate, or bicarbonate ions has no effect on the results. One important condition for the quantitative determination of fluoride ion with an ion-selective electrode, however, lies in the need for the total extraction of this ion from the sample material. In biological matter some of the fluoride ions are adsorbed on protein, which requires an effective extracting agent. In the present work a unified method for determining fluorine in yeast and other hydrolysis production by-products was developed by employing trichloroacetic acid as an extraction agent. The method was used at the Leningrad Pilot Production and Kirov Biochemical Plants. References 5 (Russian).

Catalysis Institute Official Interviewed on Licensing of Process

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[Interview by IZVESTIYA correspondent A. Illarionov with Laboratory Chief at the USSR Academy of Sciences Siberian Branch Catalysis Institute Dr. of technical sciences Yu. Matros, under the rubric "Details for 'Izvestiya': "The Russian Process Has Attracted the Attention of Japanese Industrialists and Western Businessmen, But Is It Popular At Home?"]

[Text] Novosibirsk—The USSR Academy of Sciences Siberian Branch Catalysis Institute received a telegram from Japan. The Hitachi Zossen machine-building firm reported that a non-ferrous metallurgy plant near the city of Osaka has been the first in Japan to start up equipment for the production of sulfuric acid from industrial waste sulfur dioxide at a concentration that was previously too low for processing purposes by traditional methods.

The equipment for this process was manufactured by the Japanese firm in accordance with a Soviet license it acquired for the manufacture of fundamentally new industrial apparatus that operates in accordance with the so-called non-stationary catalytic process—or the "Russian process," as it is called by USA chemists—which was designed and implemented for the first time in the world at the Catalysis Institute in Akademgorodok.

In addition to producing a useful product, this equipment simultaneously performs an environmentally protective role, since it removes harmful substances from industrial plant waste products. The manufacture of this equipment requires several times less metal than is required for the traditional equipment. The equipment is autothermic, i.e., it not only does not require the usual expenditure of heat to maintain chemical reactions, but the equipment itself produces high-temperature heat that can be used for heating or manufacturing purposes.

When a country like Japan, which is so highly developed in terms of scientific technology, purchases a new manufacturing process in the USSR, one cannot help but become interested. Consequently, your correspondent wasted no time in arranging a meeting with Yu. Matros, the laboratory chief at the Catalysis Institute.

[Illarionov] The first plant to turn out products in Japan is a demonstration plant. What are your partners in Japan gaining by this?

[Matros] As you know, a businessman prefers that a new process be shown to him when it is in actual operation. That is why the Japanese machine builders leased a production sector at a non-ferrous metallurgy plant to install this kind of machinery, to operate it, and to demonstrate it to potential customers. The equipment was installed in a way that would enable customers to see and evaluate all of the advantages of a fundamentally new chemical reactor.

By the way, we should learn from our Japanese partners how to show something's real worth. Our first units were installed in a such a way at our own plants that, more often than not, demonstrating their advantage in operation was quite difficult, if not impossible at times. Never mind about linking computers to the equipment. This kind of incompetence or unwillingness constitutes a primary obstacle in the path of wide-scale introduction of new equipment in our industry.

[Illarionov] Which countries besides Japan have given high ratings to the effectiveness of the non-stationary catalytic processes?

[Matros] The installation of an industrial aggregate at the Plovdiv Ferrous Metallurgy Combine in Bulgaria is proceeding at full speed. And this is not a gift under the guise of joint projects, as was the case of in our earlier practice with socialist country partners. This was a mutually profitable purchase of a Soviet license in Bulgaria, i.e., a transition in our relationships with our partners among the CEMA member-countries to a modern economic base that is fair and reliable.

As regards the Western capitalist countries, I recently returned from Italy from a visit to one of the plants of the Veneta Mineraria firm, where an agreement was signed for the purchase of such a license. The people there are confident that within a year an industrial plant of our design will be installed.

We have discussed specific production applications of the non-stationary catalytic processes with the Lurgi company in the FRG, with Monsanto in the USA, and with many other firms that are seriously studying the conditions attached to the acquisition of licenses.

[Illarionov] With your designs so popular abroad, you probably have at your disposal a rather decent sum of convertible foreign currency to acquire the very latest laboratory equipment and to expand your research?

[Matros] I wouldn't want to mention the exact sum, because that is a commercial secret in our relations with our foreign partners, but in round figures one can say that the export of the non-stationary catalysis process has already earned us hundreds of thousands of dollars, and we are acquiring foreign laboratory equipment and computers. We are getting a powerful, economic stimulus to expand business contacts with foreign partners.

[Illarionov] Non-stationary catalysis is known abroad as a money-saving, energy-saving, and, moreover, ecological production process. Has it been positively appraised by our own industry?

[Matros] Several years ago, when non-stationary catalysis was little known, it was perceived with interest at non-ferrous metallurgy enterprises. And today plants that produce sulfuric acid from low concentration gaseous waste are in operation at the Pechenga-Nickel combines, the Ust-Kamenogorsk Lead-Zinc combine, the Mednogorsk Copper-Sulfur combine, the Krasnoural

Metallurgical Mining Combine, and several others. Thus, as a reward, as it were, for the attention it has given to scientific-technical progress, the Ministry of Non-Ferrous Metallurgy is getting about a half million tons of sulfuric acid annually from gaseous wastes and, by the same token, is taking the first steps to diffuse a serious ecological situation. One plant alone on the Kola Peninsula has reduced the total discharge of sulfur dioxide gas in this region by 15 percent.

[Illarionov] I can't be sure from your comments whether you are pleased that the gaseous pollution has been reduced by one-sixth or whether you are disturbed by the fact that five-sixths of these discharges are still polluting the atmosphere of the Kola Peninsula?

[Matros] Your question is reasonable. In the seven years since IZVESTIYA became the first of the newspapers to report the research on non-stationary catalysis, time has pushed the ecological role of this technology to the forefront. Today there is no other method that, with a minimal capital investment and expenditure of energy, is capable of removing not only sulfur dioxide from industrial waste gases, but also various organic substances, nitrogen oxides, and carbon monoxide. You'd think that chemical, petrochemical, mineral fertilizer, and metallurgy enterprises would snatch up our design and implement it on a broad scale. In practice, however, in spite of the urgent ecological situation, the country only has about fifteen industrial non-stationary catalytic plants for detoxifying gaseous discharges. Three of them are at the Novosibirsk Chemical Plant, one is at the Biysk Oleum Plant, a few are in Kemerov and in Omsk, and one is in Moscow.

[Illarionov] So far, that is only a single drop in the enormous flow of industrial pollutants. Why is there such an amazing lack of interest in an economical, simple method of detoxifying waste gases?

[Matros] First of all, the administrative measures taken in this direction have not been very effective, and we are

dragging our feet in the introduction of the kinds of effective legal, economic measures that have long been in place in the developed countries. It is today much cheaper for an enterprise to pay a fine for pollution than to install an inexpensive detoxification plant. The only thing that'll work is if enterprises have to pay heavy fines based on the level of harmful pollutants they discharge. Then the collective at the enterprise would realize that such a plant would save them millions of rubles, and there is no alternative but to quickly such a plant.

But economic measures alone will not quickly resolve this problem. If such a fine were imposed, we would immediately get thousands of rush orders for the manufacture of detoxification units. But the Catalysis Institute is an academic scientific institution, not a machine-building plant.

[Illarionov] What kinds of steps, in your view, in addition to economic stimuli, should be taken to heighten concern about atmospheric protection?

[Matros] Economic measures should be reinforced by organizational steps, which should be taken beforehand. One solution would entail the assignment of plant capacities resulting from the conversion of defense plants to a production collective with appropriate engineering expertise to set up and operate our equipment.

At such a plant or major plant shop, a special design bureau should be organized for designing equipment, with our assistance, for specific production conditions. That should get under way today. Only then can one expect both a decisive shift in the ecological situation and widespread introduction of the "Russian process" in our own industrial sector.

And we should be able to sell modern equipment abroad as well as licenses. That would be very advantageous for the country. If we can earn hundreds of thousands of dollars for licenses, we should be able to earn millions for equipment.

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